L2: Entry 11 of 16 File: USPT Aug 2, 1994

DOCUMENT-IDENTIFIER: US 5334316 A
TITLE: Process of using polytetraalkylammonium and polytrialkylamine-containing ligands bonded to inorganic supports for removing and concentrating desired ions from solutions

Detailed Description Text (4):
The polytetraalkylammonium- or polytrialkylamine-containing ligands, as represented by Formula 1, may be prepared by reacting a silane-spacer compound with an amine ligand compound to form an Intermediate [1] as follows: ##STR2## wherein Q and A are reactive groups such as epoxy and amino respectively which will react with each other allowing the formation of the Intermediate [1] compound shown above. The silane-spacer-ligand complex shown above as Intermediate [1] is then covalently attached to an inorganic solid support material such as silica gel and the amine groups are quaternized to form the polytetraalkylammonium or methylated to form the polytrialkylamine ligand containing solid support matrix of Formula 1 as follows: ##STR3## All symbols, except Q and A have the meanings first given above. When Q is epoxy, the epoxy group reacts with A in such a manner that Q becomes part of the spacer to form a linkage ##STR4##

L2: Entry 10 of 16 File: USPT Aug 9, 1994

DOCUMENT-IDENTIFIER: US 5336518 A
TITLE: Treatment of metallic surfaces using radiofrequency plasma deposition and chemical attachment of bioactive agents

Detailed Description Text (9):
Where a spacer molecule is added directly to the HFBMA coating, the stent is typically placed in a solution of the spacer and exposed to the solution for several minutes. Where a spacer such as polyethylenimine (PEI) is used, a PEI concentration of about 1% by weight is generally adequate with the stent being exposed to the solution for about 5 minutes. Other spacers may require different exposure times depending upon the spacer and the concentration thereof. A stent exposed to a solution of albumin at a concentration of 3.33 mg/ml typically requires exposure to the solution for approximately 15 minutes. Following exposure to the spacer solution, the stent is typically rinsed and/or air dried for a suitable period of time and, in the case of silane spacer, the stent may be oven cured at an elevated temperature of between about 100.degree. C. and about 120.degree. C.

L32: Entry 21 of 69 File: USPT Aug 8, 1989

DOCUMENT-IDENTIFIER: US 4855234 A
TITLE: Biologically active protein immobilized with a polymeric fibrous support

Abstract Text (1):
A composite article is prepared having in sequence a fibrous support which has been subjected to a surface treatment to provide binding sites thereon, a layer of a protein immobilizer compound, and a biologically active protein such as enzyme. The surface treatment can be carried out by coating the surface with an inorganic oxide or by subjecting the surface to plasma treatment.

Parent Case Text (12):
Solutions of the enzyme catalase have also been added to decompose hydrogen peroxide in solutions previously used to sterilize contact lenses. See, for example, European Patent application 82710055.3. However, if introduced into a solution with a lens, catalase can bind to the lens, compounding the familiar protein deposit problem associated with the use of contact lenses.

Parent Case Text (13):
It is known in the art that certain proteins can be immobilized on specific supports. U.S. Pat. No. 4,098,645 describes the immobilization of enzymes on isocyanate end-capped polyurethane polymer foams, and catalase is one of a long list of enzymes listed and claimed.

Parent Case Text (15):
U.S. Pat. No. 4,210,722 describes a method of immobilizing a protein such as an enzyme on a polar support in a variety of configurations which can be glass, ceramic, inorganic oxide, etc. comprising applying a layer of a polymer having repeatig units containing a beta-hydroxyalkyleneamine moiety such as the dimethylamine adduct of epoxidized polybutadiene to a polar support and contacting the treated support with an aqueous solution of the protein. One of the enzymes exemplified in this patent is catalase.

Parent Case Text (19):
Fibrous supports, such as woven and particularly nonwoven webs, because of their ease of handling and high surface area, provide desirable constructions upon which proteins such as enzymes can be immobilized. It has been found, however, that some of the typical polymers used to make woven and nonwoven webs, such as polyalkylenes, do not irreversibly absorb or bind the protein immobilizers known to the art. Immobilized proteins such as enzymes can retain a substantial portion of their biological activity even though bound to a support.

Parent Case Text (23):
A two-container, two-step method involves separate, noncompeting reactions. In the first step lenses are put into a container containing an amount of hydrogen peroxide sufficient for disinfecting the lenses in a short period of time (about 10 minutes). In the second step, as is known in the art, the lenses are then transferred to a second container which contains a saline solution and a disc of platinum. The platinum disc catalytically converts the hydrogen peroxide into molecular oxygen and water. The lenses are soaked in the second container for four or more hours to remove the residual hydrogen peroxide from the lenses. Other systems which have been used to remove the hydrogen peroxide from the lenses can include either the use of a solution of sodium bicarbonate or the enzyme catalase in solution. These systems may

L15: Entry 13 of 43 File: USPT Feb 25, 1986

DOCUMENT-IDENTIFIER: US 4572897 A
TITLE: Carrier for immobilizing enzymes

Brief Summary Text (9):
Another typical known carrier granule belonging to this category is described in Advances in Experimental Medicine and Biology, Vol. 42, Pp. 191-212, Immobilized Biochemicals and Affinity Chromatography. This carrier consists of glass beads with a silane coupling agent. These beads have excellent flow properties and relatively high loading capacity. However, they are very expensive, and like all inorganic carrier granules, to render them suitable for immobilizing enzymes, elaborate chemical treatment has to be performed, involving often the use of undesirable reagents.

L15: Entry 1 of 43 File: USPT Dec 21, 1999

DOCUMENT-IDENTIFIER: US 6004786 A
TITLE: Inorganic carrier containing bound silane coupling agent having carboxylic-ester group for immobilizing lipase

Brief Summary Text (7):
As a typical example of such enzyme immobilized in the inorganic carrier (hereinafter, referred to "immobilized enzyme") including the silane coupling agent, carbohydrate-decomposing enzymes such as .alpha.-amylase, glucoamylase, and so on are known. However, since these enzymes have a low activity; i.e., a poor reactivity with starch or other substrates, compared to the enzyme not immobilized in carrier, a great amount of the immobilized enzyme is required to obtain the same level of reactivity in a non-immobilized enzyme. Accordingly, the immobilized enzyme is not adapted for a producing process in an industrial field. In order to overcome this problem, Japanese Patent Publication No. 5-219952 and 4-51894 disclose a novel carrier and method for immobilizing enzyme into the carrier.

Brief Summary Text (15):
To accomplish the above described objectives, an improved inorganic carrier is produced by combining inorganic carrier with the coupling agent having carboxylic-ester linkage, and an improved inorganic carrier for carrying lipase is produced by combining inorganic carrier with the coupling agent having carboxylic-ester linkage. The coupling agent having carboxylic-ester linkage is a silane coupling agent. The inorganic carrier is selected from kaolinite type carriers for immobilizing enzyme or any carriers, having the functional group capable of bonding to silane coupling agent, such as porous glass, bentonite, silica gel, alumina, silica, silica-alumina hydroxy apatite, calcium phosphate-gel, and so on.

Brief Summary Text (18):
Such improved inorganic carriers for immobilizing enzyme and immobilized lipase provide extraordinary advantages. In detail, the carrier and immobilized lipase produced by the present invention have an extremely high activity even though the amount of protein adsorbed to the carrier is not as much as in the conventional manner where lipase is carried with other carriers combined with the silane coupling agents having no carboxylic-ester linkage or non-treated carriers. In other words, the carrier and immobilized lipase produced by the present invention have a relative extremely high activity to the amount of protein adsorbed to the carrier and an extremely low deterioration during the activity. Furthermore, the process provided by the present invention to bond the functional groups contained in lipase protein to carboxylic-ester does not need a complicated immobilizing treatment, but only ordinarily immobilizing steps wherein the lipase solution having a predetermined concentration is mixed and stirred with carrier, and then the mixture is subjected to filtering and drying. The produced carrier and immobilized lipase can be repeatly used with hardly lowering its activity. Particularly, in repeated batch-reaction process, the produced carrier and immobilized lipase according to the present invention can be advantageously used, free from lowering their activity.

Detailed Description Text (6):
The inorganic carrier to be used in the present invention is selected from kaolinite type carriers for immobilizing enzyme or any carriers, having the functional group capable of bonding to silane coupling agent, such as porous glass, bentonite, silica gel, alumina, silica, silica-alumina hydroxy apatite, calcium phosphate-gel, and so

on.

Detailed Description Text (7):
In the following embodiments of the present invention, the kaolinite-type carrier for immobilizing enzyme, formed in particle having an average diameter of 200 .mu.m, was used to combine various silane coupling agents onto the surface of the carrier, and then to make the carrier carry lipase. Thus produced carrier examples were subjected to various tests to compare their reaction activities. The result of these tests clearly indicated that the samples based on No. 1 to No. 3 had higher activity than the conventional samples based on No. 4 to No. 9 even though the amount of protein adsorbed to the carriers produced by the present invention was not especially large. In detail, the carrier combined with the silane coupling agent having carboxylic-ester linkage selected from .gamma.-methacryl oxypropyltrimethoxy silane, .gamma.-acetoxypropyltrimethoxy silane and .gamma.-acryloxypropyltrimethoxy silane was used to carry lipase, (hereinafter, this is referred to as "ester-combined immobilized lipase). On the other hand, the carrier combined with the other silane coupling agent having no carboxylic-ester linkage was used to carry lipase, (hereinafter, this is referred to as "other silane coupling immobilized lipase").

Detailed Description Text (11):
Generally, since commercially available lipase includes much coase enzyme powder which also includes various protein materials in addition to pure lipase protein, it is impossible to selectively carry such pure lipase protein component on the carrier. Therefore, in order to increase the activity it is necessary to make a large amount of highly concentrated coarse enzymic lipase to adsorb a great amount of protein onto the carrier. This will result in difficult immobilizing operation and also requires the carrier having an extremely high adsorbability. On the contrary, when the carrier combined with the silane coupling agent having carboxylic-ester linkage is used, it is possible to produce the immobilized lipase having a remarkably high activity even though the carrier is not adsorbed with a great amount of protein.

Detailed Description Text (18):
Each of the silane coupling agents, No. 1 to No. 3 in Table 1, having carboxylic-ester linkage, 0.2 g, was diluted by toluene, 1.8 g. Kaolinite type carrier for immobilizing enzyme, 1.5 g, was added into the toluene diluted silane coupling agent solution, and mixed for one hour. The solution was separated into solid part and liquid part. The solid part was dried at 110.degree. C. for 30 min. Thus the carrier material was produced.

Detailed Description Text (21):
Each of the silane coupling agents No. 4 to No. 9 shown in Table 1, 0.2 g, was diluted by toluene, 1.8 g. Kaolinite type carrier for immobilizing enzyme, 1.5 g, was added into the toluene diluted silane coupling agent solution, and mixed for one hour. The solution was separated into solid part and liquid part. The solid part was dried at 110.degree. C. for 30 min. Thus the carrier material was produced.

CLAIMS:

1. An enzyme immobilizing carrier to immobilize lipase, comprising an inorganic carrier for carrying lipase, wherein said inorganic carrier is bonded to a silane coupling agent having a carboxylic-ester group.

2. The enzyme immobilizing carrier as set forth in claim 1, wherein said silane coupling agent having a carboxylic-ester group is represented by a general formula RCOO(CH.sub.2).sub.n SiR'.sub.3 represents an organic functional group, R' represents a radical selected from the group including lower alkoxy, phenoxy, and halogen, and n represents an integral number.

3. The enzyme immobilizing carrier as set forth in claim 1, wherein said silane coupling agent having a carboxylic-ester group is selected from any one of .gamma.-methacryl oxypropyltrimethoxy silane, .gamma.-acetoxypropyltrimethoxy silane, and .gamma.-acryloxypropyltrimethoxy silane.

4. The enzyme immobilizing carrier as set forth in claim 1, wherein said inorganic carrier is selected from any carriers having a functional group capable of combining with said silane coupling agent.

L15: Entry 3 of 43 File: USPT May 26, 1998

DOCUMENT-IDENTIFIER: US 5756415 A
TITLE: Method of making a enzyme immobilizing carrier

Detailed Description Text (10):
In order to increase the immobilized ratio of enzyme, the surface of the produced carrier is suffered from any suitable silane coupling agent and then glutaraldehyde. Since this is one of conventional immobilizing manners, the other commonly used manners may be also applied. Enzyme can be concentratedly and firmly immobilized to the surface of the porous carrier through covalent bonds.

Detailed Description Text (42):
The carrier sample was suffered from a silane coupling agent and glutaraldehyde in the same manner as Embodiment 4, and then immobilized with enzyme. This enzyme immobilized sample was subjected to the measurement of enzyme activity. On the same occasion, a comparative sample was prepared in the same manner as Embodiment 4 by using a typically used commercial available carrier, Chitopearl, chitosan beads having an average particle diameter of 1000 .mu.m, for immobilizing enzyme. It is well known that Chitopearl has an excellent capability of generating enzyme activity. Also this comparative sample was subjected to the measurement of enzyme activity under the same condition as above. The resulted data is shown in FIG. 7. The data shows the comparative effects among the sample H-1500 according to Embodiment 5, the sample H-250 according to Embodiment 3, and Chitopearl as the comparative sample. Although the enzyme activity of the sample H-1500 is slightly lower than that of the sample H-250, it is about twice as Chitopearl which has been believed to have an excellent capability of generating enzyme activity. As a result, the method of the present invention may increase the particle size of the carrier particle to overcome the problem caused by the pressure loss owing to the high viscous reactant. For example, even when the average particle diameter is so large as 1500 .mu.m, the carrier produced by the method according to the present invention can generate a practically available enzyme activity and have a relatively lower pressure loss. Accordingly, these results means that the particle diameter having several mm can be practically used.

L15: Entry 4 of 43 File: USPT Mar 25, 1997

DOCUMENT-IDENTIFIER: US 5614401 A
TITLE: Enzyme immobilizing carrier containing kaolin

Detailed Description Text (10):
In order to increase the immobilized ratio of enzyme, the surface of the produced carrier is suffered from any suitable silane coupling agent and then glutaraldehyde. Since this is one of conventional immobilizing manners, the other commonly used manners may be also applied. Enzyme can be concentratedly and firmly immobilized to the surface of the porous carrier through covalent bonds.

Detailed Description Text (42):
The carrier sample was suffered from silane coupling agent and glutaraldehyde in the same manner as Embodiment 4, and then immobilized with enzyme. This enzyme immobilized sample was subjected to the measurement of enzyme activity. On the same occasion, a comparative sample was prepared in the same manner as Embodiment 4 by using a typically used commercial available carrier, Chitopearl, chitosan beads having an average particle diameter of 1000 .mu.m, for immobilizing enzyme. It is well known that Chitopearl has an excellent capability of generating enzyme activity. Also this comparative sample was subjected to the measurement of enzyme activity under the same condition as above. The resulted data is shown in FIG. 7. The data shows the comparative effects among the sample H-1500 according to Embodiment 5, the sample H-250 according to Embodiment 3, and Chitopearl as the comparative sample. Although the enzyme activity of the sample H-1500 is slightly lower than that of the sample H-250, it is about twice as Chitopearl which has been believed to have an excellent capability of generating enzyme activity. As a result, the method of the present invention may increase the particle size of the carrier particle to overcome the problem caused by the pressure loss owing to the high viscous reactant. For example, even when the average particle diameter is so large as 1500 .mu.m, the carrier produced by the method according to the present invention can generate a practically available enzyme activity and have a relatively lower pressure loss. Accordingly, these results means that the particle diameter having several mm can be practically used.

L32: Entry 25 of 69 File: USPT Jul 12, 1988

DOCUMENT-IDENTIFIER: US 4757014 A
TITLE: Immobilization of biologically active protein on a polymeric fibrous support

Abstract Text (1):
A composite article is prepared comprising in sequence a fibrous polymeric support which has been subjected to a surface treatment to provide binding sites thereon, a layer of a protein immobilizer compound, and a biologically active protein. The surface treatment comprises coating the support with a 2 to 500 nm thick layer of inorganic oxide or subjecting the support to a plasma treatment. The protein immobilizer can be a polymer or silane-functional compound. The biologically active protein can be the enzyme, catalase, which has use in decomposing hydrogen peroxide when disinfecting contact lenses.

Brief Summary Text (11):
Solutions of the enzyme catalase have also been added to decompose hydrogen peroxide in solutions previously used to sterilize contact lenses. See, for example, European Patent application No. 82710055.3. However, if introduced into a solution with a lens, catalase can bind to the lens, compounding the familiar protein deposit problem associated with the use of contact lenses.

Brief Summary Text (12):
It is known in the art that certain proteins can be immobilized on specific supports. U.S. Pat. No. 4,098,645 describes the immobilization of enzymes on isocyanate end-capped polyurethane polymer foams, and catalase is one of a long list of enzymes listed and claimed.

Brief Summary Text (14):
U.S. Pat. No. 4,210,722 describes a method of immobilizing a protein such as an enzyme on a polar support in a variety of configurations which can be glass, ceramic, inorganic oxide, etc. comprising applying a layer of a polymer having repeating units containing a beta-hydroxyalkyleneamine moiety such as the dimethylamine adduct of epoxidized polybutadiene to a polar support and contacting the treated support with an aqueous solution of the protein. One of the enzymes exemplified in this patent is catalase.

Brief Summary Text (18):
Fibrous supports, such as woven and particularly nonwoven webs, because of their ease of handling and high surface area, provide desirable constructions upon which proteins such as enzymes can be immobilized. It has been found, however, that some of the typical polymers used to make woven and nonwoven webs, such as polyalkylenes, do not irreversibly adsorb or bind the protein immobilizers known to the art. Immobilized proteins such as enzymes can retain a substantial portion of their biological activity even though bound to a support.

Brief Summary Text (22):
A two-container, two-step method involves separate, noncompeting reactions. In the first step lenses are put into a container containing an amount of hydrogen peroxide sufficient for disinfecting the lenses in a short period of time (about 10 minutes). In the second step, as is known in the art, the lenses are then transferred to a second container which contains a saline solution and a disc of platinum. The platinum disc catalytically converts the hydrogen peroxide into molecular oxygen and water. The lenses are soaked in the second container for four or more hours to

remove the residual hydrogen peroxide from the lenses. Other systems which have been used to remove the hydrogen peroxide from the lenses can include either the use of a solution of sodium bicarbonate or the enzyme catalase in solution. These systems may use one or two containers but always require two steps: first a soak in hydrogen peroxide and second a neutralization step.

Brief Summary Text (25):
The present invention permits the use of a one-container, one-step system by controlling the amount of enzyme present. The amount of immobilized enzyme put into the container can be controlled by selecting the appropriate amount of composite article. A low amount of enzyme will cause a slow neutralization of hydrogen peroxide which will allow the disinfection to take place. If, on the other hand, a fast system for hydrogen peroxide disinfection is desired, a two-step system would be preferable: a large concentration of enzyme can be put into the container after the 10-minute disinfecting soak and the large amount of enzyme will neutralize the hydrogen peroxide very rapidly, reducing the total required time for disinfection. A very fast system is highly desirable for patients wearing extended wear lenses who do not wish to leave their lenses out of their eyes for the four- to six-hour period required by products currently available.

Brief Summary Text (26):
The activity of the enzyme in neutralizing hydrogen peroxide can also be attenuated by use of controlled release technology, as is known in the art. For example, the composite article of the invention may be coated with a slowly erodable polymer such as a cellulose derivative, poly(N-vinyl pyrrolidone) or poly(vinyl alcohol). The erodable polymer coating on the surface prevents the enzyme from neutralizing the hydrogen peroxide and slowly dissolves in the hydrogen peroxide solution. When the polymeric coating has dissolved into the solution, the enzyme neutralizes the hydrogen peroxide at a rate proportional to the amount of active enzyme present.

Brief Summary Text (60):
Protein immobilizers useful in the method of the invention are any of the known polymers which adhere readily to polar supports and provide immobilization of proteins, such as enzymes, while preferably retaining substantially all of the biological activity of the protein.

Brief Summary Text (65):
Enzymes immobilized by, for example, .beta.-hydroxyalkyleneamine-coated fibrous supports as described herein, are useful in enzymatic chemical processing in the conventional manner. Examples thereof include the use of glucose isomerase in the conversion of glucose to fructose, and the use of lactase in the removal of lactose during the isolation of proteins from cheese whey. Further examples of enzymes which can be strongly attached, for example, to the .beta.-hydroxyalkyleneamine polymers include urease, glucose oxidase, invertase, catalase, peroxidase, papain, lipase, cellulase, dextranase, amylase, ribonuclease, carboxypeptidase and urokinase.

Detailed Description Text (3):
The catalase used throughout the Examples is commercially available catalase with activity (according to the manufacturer, Sigma Chemical Co.) of 40,000 International Units per milligram. However the activity was measured by a standard assay (described by Beers and Sizer, J. Biol. Chem. 195, 133 (1952)) wherein one unit of enzyme decomposed one micromole of hydrogen peroxide per minute at 15.degree. C. at pH 7, to be 20,500 IU per milligram unless otherwise specified. All percents are by weight unless otherwise specified.

CLAIMS:

11. The article according to claim 1 wherein said protein is an enzyme.

12. The article according to claim 11 wherein said enzyme is urease, glucose oxidase, invertase, peroxidase, catalase, papain, lipase, cellulase, dextranase, amylase, ribonuclease, carboxypeptidase or urokinase.

13. The article according to claim 11 wherein said enzyme is catalase.

L21: Entry 12 of 26 File: USPT Sep 3, 1996

DOCUMENT-IDENTIFIER: US 5552325 A
TITLE: Method for separation and recovery of biological materials

Brief Summary Text (12):
By the term "selection means" is meant means for selecting certain desired biological substances to be recovered, separated, or resolved from a chromatographic gel or other medium, or from a mixture of biological substances As used herein, such means comprise a matrix or carrier comprising a web, membrane, or other physical configuration of a plastic polymer which is porous, i.e. permeable to liquids and certain undesired materials, but which affords sites capable of selectively (and desirably releasably) binding the desired biological material, such sites being located at moieties integral with the plastic polymer per se or, most preferably, located on or in organic or inorganic particulate entities physically or chemically incorporated within the plastic polymer. Amongst the organic particulates are included both hydrophilic and hydrophobic entities. In the case of composites containing particles incorporated in a plastic polymer, for example, these sites may comprise the surface of the particulate substances per se, e.g. cellulose such as microcrystalline cellulose or more preferably, silica, which binds DNA, and thus provides a DNA selection means.

Other Reference Publication (3):
Baum et al. In Immobilized Enzymes, Antigens, Antibodies, and Peptides, Weetall (ed), Marcel Dekker Inc. pp. 419-496 (1975).

L15: Entry 16 of 43 File: USPT May 17, 1983

DOCUMENT-IDENTIFIER: US 4384045 A
TITLE: Activation of a siliceous carrier for enzyme immobilization

Brief Summary Text (13):
In U.S. Pat. No. 3,519,538, Messing and Weetall describe an immobilized enzyme composition in which the enzyme is covalently coupled to an inorganic carrier through an intermediate silane coupling agent, the silicon portion of the coupling agent being attached to the carrier and the organic portion of the coupling agent being attached to the enzyme. While glass of controlled porosity was the preferred carrier material, a wide variety of inorganic carrier materials, often siliceous, are disclosed as being useful. The carrier was prepared for use by substantial exposure to nitric acid, followed by furnacing in an oxygen atmosphere.

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L15: Entry 8 of 43 File: USPT Jan 30, 1990

DOCUMENT-IDENTIFIER: US 4897468 A
TITLE: Immobilization of peptide-containing compounds on metal hydroxide gels

Brief Summary Text (5):
Recently, immobilized glasses which comprise immobilized peptide-containing compounds such as an enzyme or the like on a glass carrier have been employed as bioreactors for use in analysis, diagnosis or synthesis. As a process for producing these bioreactors, a process which comprises treating the surface of a SiO.sub.2 type glass previously obtained by a fusion technique with an alkali to form hydroxy groups therein, introducing, e.g., aminoalkyl groups, into the hydroxy group and then immobilizing an enzyme or the like, is known and has been reduced to practical use. To introduce functional groups such as the aforesaid aminoalkyl groups, a method using various silane coupling agents is known.

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L5: Entry 7 of 7 File: USPT Jun 30, 1998

DOCUMENT-IDENTIFIER: US 5773308 A
TITLE: Photoactivatable o-nitrobenzyl polyethylene glycol-silane for the production of patterned biomolecular arrays

Brief Summary Text (14):
The compound of the present invention is an o-nitrobenzyl analog that has a photoremovable component that has a resistance to the adsorption of biomolecules and a linking group for attaching the compound to a substrate. When exposed to ultraviolet light, the photoremovable component is removed, creating an active site on the compound to which an anti-ligand can be covalently bonded. By using repeated sequential steps of masking, irradiating, binding an anti-ligand and washing, a patterned substrate can be created that can be used as a multianalyte array sensor for detecting different ligands simultaneously. The use of a photoactivatable o-nitrobenzyl analog and, in particular, o-nitrobenzyl polyethylene glycol (PEG)-silane in the creation of a patterned substrate has several distinct advantages over other chemical modifiers used for the (photo)immobilization of biomolecules. First, the unique composition of the o-nitrobenzyl PEG-silane combines both the ability to prevent non-specific biomolecule adsorption with the ability to become photoactivated by UV light so that micron-sized patterns can be created without interfering biomolecule adsorption. Second, the photochemical reaction which occurs during the patterning step also provides the reactive group which is used to bind the recognition molecule, thus eliminating the need for cross-linkers. In addition, the aldehyde moiety produced during photolysis is able to form stable, covalent bonds with a wide variety of biomolecules, including antibodies, enzymes, proteins, peptides, and DNA/RNA. Third, the density of recognition molecules which are incorporated in the sensor can be easily controlled through the extent of irradiation of the o-nitrobenzyl PEG-silane and/or via the concentration of the capture molecule (anti-ligand) applied during the sensor preparation. Fourth, the o-nitrobenzyl PEG-silane is quite resistant to chemical and biological degradation, making long-term storage of the sensor precursors facile, and eliminating the problems that other biosensors have with bacterial or microbial degradation. And finally, the o-nitrobenzyl PEG-silane is only photoactive in the UV region of the spectrum, so the sensor can be stored and used without taking special precautions to prevent exposure to normal room lighting.